

An Econometric Analysis of IBRD Creditworthiness

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Abstract

Mckenzie econometrically ascertains the determinants of default to the International Bank for Reconstruction and Development (IBRD) through panel logit analysis.

Creditworthiness with a lag of one period is determined by the extent of arrears to private creditors, the proportion of total debt service that is being paid, the government budget deficit, the extent of military involvement in the government of a country, and by the G7's current account balance.

Default to the IBRD falls into a graduated hierarchy, whereby default occurs first to Paris Club and commercial bank creditors, with subsequent default triggered by portfolios with high proportions of IBRD and short-term debt, as well as the factors mentioned

above. Default to these other creditor groups can be explained by more traditional country risk variables, although Mckenzie's analysis highlights the importance of political and external factors in explaining default to all creditors studied. He finds sovereign default to be a state-dependent process, whereby the repayment behavior of a country changes once it enters into default.

Operationally, Mckenzie arrives at a model that can be used to assess short-term creditworthiness, although data imperfections and availability still limit the usefulness of the model for some countries. Longer-term risk assessment proves more difficult, which raises operational questions for the IBRD.

This paper—a product of the Credit Risk Division, Office of the Senior Vice President and Chief Financial Officer—is part of a larger effort in the Bank to monitor the creditworthiness of IBRD borrowers. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Clarita Mendoza, room MC6-120, telephone 202-458-0599, fax 202-522-2475, email address cmendoza@worldbank.org. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at mcken@stanford.edu. April 2002. (33 pages)

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AN ECONOMETRIC ANALYSIS OF IBRD CREDITWORTHINESS

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1. Introduction and background

Default to the IBRD is a rare phenomenon that is seen by many to arise purely from idiosyncratic, mainly political, shocks, in contrast to defaults to bilateral and private creditors, where economic events are deemed to play a greater role. In this study we carry out a thorough investigation of this premise, using panel logit econometric models to investigate the determinants of IBRD default. We also model default to Paris Club creditors and to commercial banks in order to determine the degree of commonality in the determinants of default across creditor groups, and to investigate the plausibility of a graduated hierarchy of default, whereby default to the IBRD occurs only after default to other creditors. Within this framework the aim is to ascertain the factors which determine whether a country will fall into default to the IBRD following default to other creditors. Operationally we wish to arrive at a model that can be used in assessing country risk as it pertains to IBRD default.

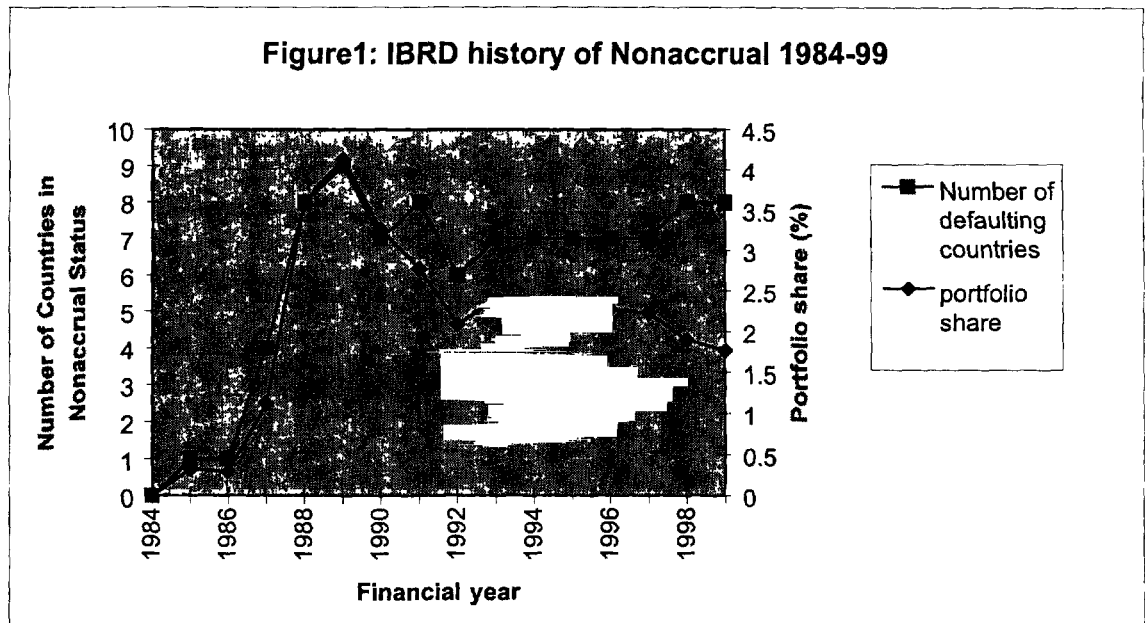
Empirical models have been used for country risk analysis since the mid-1970's, with probit and logit models emerging as the preferred estimation technique. However, attention has tended to remain focused on default to a broad group of creditors, with separate analysis of debt repayment to international organizations seemingly neglected. Aylward and Thorne (1998) address repayment performance to the International Monetary Fund and find that indicators of credit history with the Fund, together with a small number of macroeconomic variables yield a significant model of the probability of a country incurring arrears to the Fund. We carry out a similar exercise for arrears to the IBRD. However our methodology is somewhat different with a more indepth analysis of issues of state dependence and the use of random effects models where appropriate. We also consider many more determinants of default in our analysis, in particular providing a more detailed modelling of the importance of political and external factors.¹ Our work further contributes to the existing literature through its explicit consideration of a default hierarchy.

The remainder of this section describes the history of sovereign default to the IBRD over the period 1980-99, comparing it to defaults to other creditors over this time. Section 2 briefly summarizes several theories of default, Section 3 describes the variables used in this study and Section 4 carries out exploratory analysis of this data, comparing means, correlations and carrying out principal components analysis. Section 5 outlines the econometric models used in this paper. Section 6 provides the core content of the paper, reporting the results of econometric analysis of default to the IBRD, Paris Club Creditors and Commercial Banks. In this section we also model IBRD default as a two-step process, whereby debtors default to the IBRD only after default to less-preferred creditors. Finally Section 7 concludes, highlighting the key findings and their policy implications.

¹ Aylward and Thorne use two year-dependent dummy variables to account for external events. In their statistical appendix there is some consideration of the role of political factors, but they do not develop a link between political factors and Fund arrears in their econometric models.

1.1. IBRD Default History

Figure 1 details the history of IBRD nonaccruals up to the end of April 1999. The first default occurred in 1985, and we see that during the late 1980's there was a rash of subsequent defaults, peaking with 9 countries, representing 4.13% of the IBRD loan portfolio, in nonaccrual status in 1989. The 1990's have been characterized by a declining share of nonaccrual loans in the overall IBRD loan portfolio, and a fairly steady number of countries in nonaccrual. This illustrates the fact that default to the IBRD is a rare phenomenon, and thus we will not have all that many cases of defaults from which to draw our conclusions.



Source: Finance Credit Risk (FINCR) records, The World Bank.

Over the past 10-15 years the heavily indebted poor countries have experienced a withdrawal of private lenders and have become increasingly dependent on official financing, with multilateral institutions becoming the main source of loan finance for most low-income countries. The World Bank is the largest multilateral lender, with its share in total multilateral debt of developing countries exceeding 50 percent in 1996. (IMF, 1998). Much of this lending has occurred on concessional terms, in the form of IDA credits. Figure 2 shows the shares of IBRD loans and all Multilateral loans in Total debt stocks over the period 1980-97, averaged over the 63 IBRD borrowers in our sample for which we had data for each year in this period. We see the rise in the importance of multilateral loans over this period, but with the share of IBRD loans falling over the 1990's.

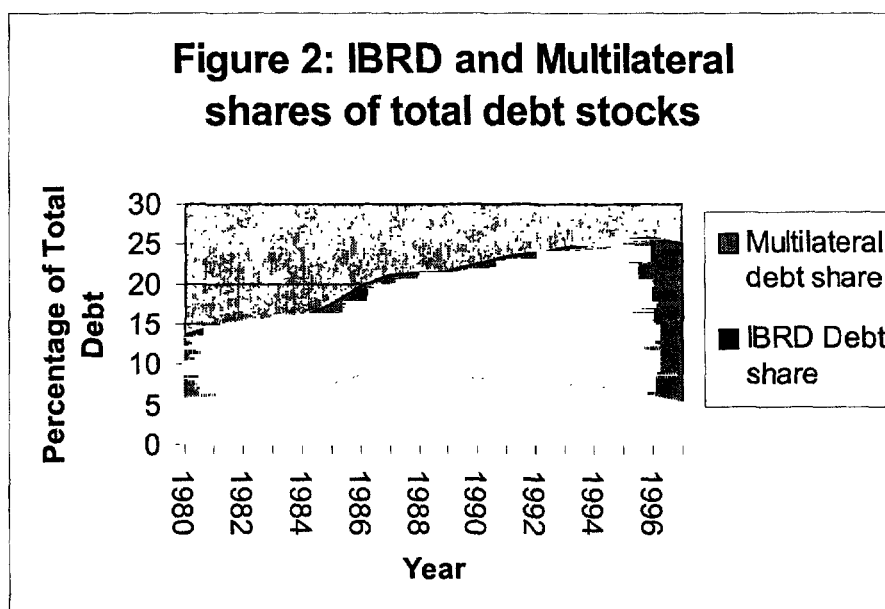
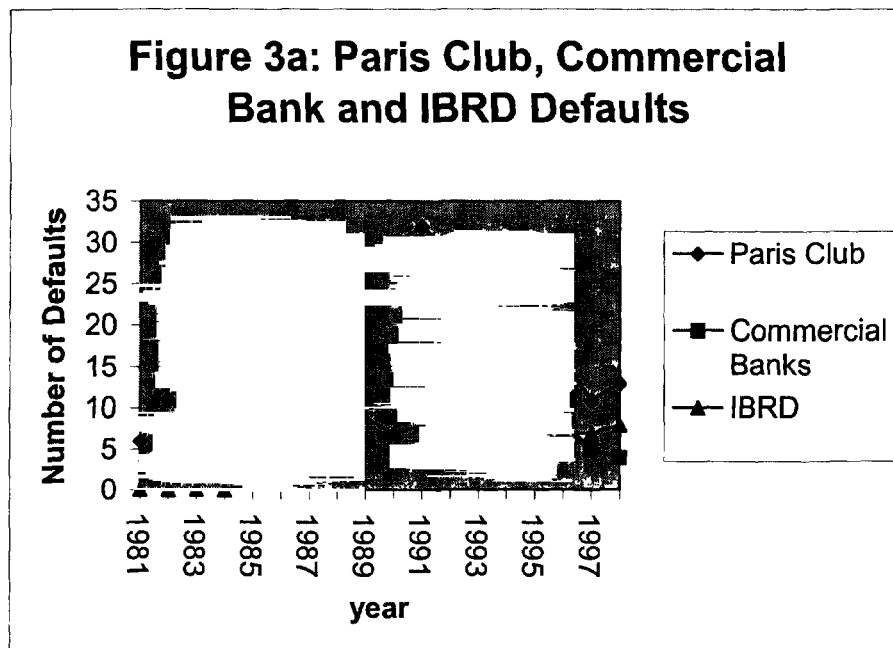


Figure 2 shows unweighted average share for the 63 IBRD borrowers in our sample for which we have observations over the entire period 1980-97. Source: World Debt Tables/Global Development Finance.

1.2. Default to Other Creditors

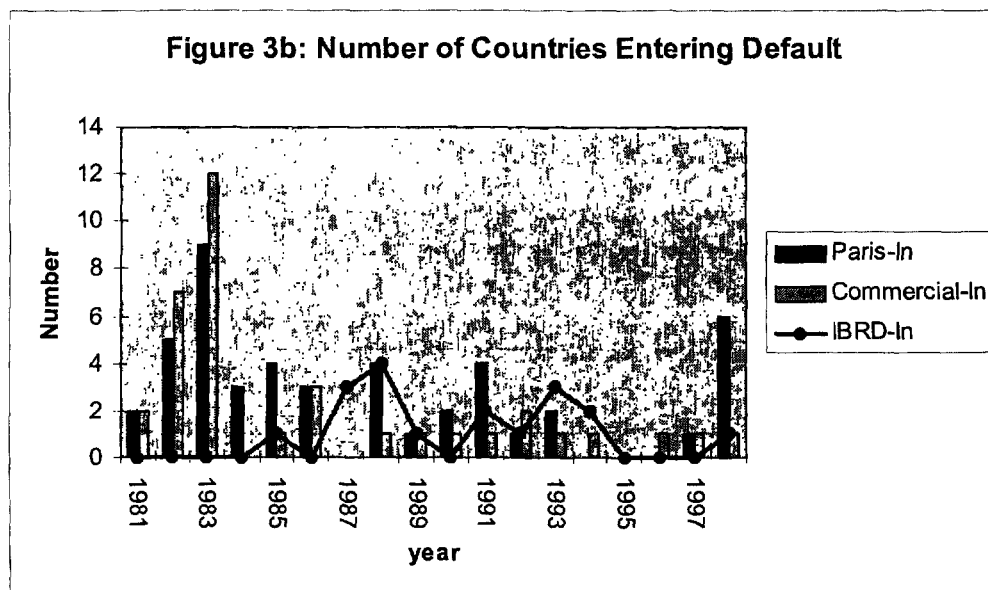
Figure 3a compares the number of countries in default to the IBRD with the number of countries in default to the Paris Club and to Commercial Banks over the period 1981-98, where default to the latter two institutions will be defined precisely in Section 3.5. We see that defaults to Commercial Banks appear to precede defaults to the Paris Club by roughly two years, with the number of countries defaulting to either institution following the same pattern - a rising number during the 1980's, and decline during the 1990s. Defaults to the IBRD did not begin to rise until after Paris Club and Commercial Bank defaults had already begun to increase, but reach a peak at around the same time as defaults to the Paris Club. The more serious implications of default to the IBRD are reflected in the relatively small number of countries in nonaccrual status to the IBRD as compared to the other creditors. This may also help explain why the number of IBRD nonaccruals do not decline in tandem with the number of defaults to the other creditors.

The likelihood of default to other creditors may differ markedly from the likelihood of default to the IBRD for certain countries. This may reflect a low level of exposure by the IBRD, with most of the country's debt coming from other sources. Secondly one must realize the more political nature of IBRD default. Political forces can raise or lower the likelihood of default. On one hand, an unstable political environment and deliberate political acts can make default more likely. In contrast, with countries that are considered to have systemic importance there is a greater likelihood that in times of trouble a rescue package will be put into place by major creditor governments, which protects the international financial institutions as a by-product. Rescue packages to Mexico, Indonesia, South Korea and Brazil following recent crises in these countries are a good example of this occurring.



Source: Tables A3.2, A2.3 Global Development Finance 1999: Analysis and Summary Tables. Washington DC, The World Bank and FINCR internal records.

Figure 3b shows the number of countries going into default in a given year, which is arguably the phenomenon of most interest. We see the effects of the Debt Crisis of the early 1980's, with the a large number of countries entering into default with Commercial Banks and the Paris Club creditors in 1982 and 1983. The upsurge in IBRD defaults did not occur until 1987-88, five years later, with a second peak in defaults in 1993 caused by the separation of former Yugoslavia. We see that to reconcile IBRD default with default to the other creditor groups one needs to carefully consider issues of timing.



Source: Tables A3.2, A2.3 Global Development Finance 1999: Analysis and Summary Tables. Washington DC, The World Bank and FINCR internal records.

Given that the number of countries defaulting to the IBRD, the Paris Club and to Commercial Banks is at a level much lower than the giddy heights of the late 1980's, one may question the need for a study determining the proximate causes of such default at the present time. However, to the contrary, we suggest that this is precisely the time to carry out such analysis, as only after having observed a period where countries are going into default, and a period where countries are leaving default status, can we hope to discover the true relationship between default and the plethora of explanatory variables used in the literature. Moreover, events following the East Asian, Russian, and Brazilian crises of 1997-98 together with a recent crop of Paris Club reschedulings have once again turned our attention to the issue of sovereign default.

2. Theoretical Explanations of Sovereign Default

Cline (1984) highlights the fact that there are two sides to a debt rescheduling, or in our case to a default on an IBRD loan. The "demand" side reflects the decision of a country to seek rescheduling or to go into nonaccrual status. Such a decision has an adverse effect on a country's credit rating, reducing the ability to borrow in the future at favourable terms, so a country will reschedule only if the opportunity cost of continued debt servicing is perceived by policymakers to be prohibitively high. This view of default is described by Ul Haque et al. (1996) as the "cost-benefit" approach, as countries contrast the costs of rescheduling or default against the benefit windfall gain. Cline suggests this demand for rescheduling will depend on the debt-service ratio, ratio of reserves to imports, rate of per capita income growth, level of per capita income and on the current account deficit. Countries incur sovereign debt for consumption-smoothing purposes, for investment purposes given an expectation of relatively high productivity, and for adjustment purposes, based on current account sustainability. Ul Haque et al. then

consider the costs of rescheduling in terms of the inability to borrow further to satisfy these motives for borrowing. In addition to the variables considered by Cline, they consider the inflation rate, export growth rate, terms of trade and real exchange rate to indicate the benefits to be had from incurring sovereign debt, and hence the costs of default. The second side consists of factors explaining the “supply” of rescheduling, or the nonsupply of foreign credit. These factors include both screening criteria which creditors use to judge a country’s creditworthiness and the influence of the international economic environment, which determines overall international lending. A reduced form equation is then estimated, which reflects the joint effect of these demand and supply side influences. As IBRD loans are of medium to longer term maturities on average, we presume that the default decision is separable from the initial borrowing decision, enabling us to not have to consider game-theoretic analysis of strategic borrowing.

The second broad theoretical approach to sovereign default risk is denoted by Ul Haque et al. (1996) as the “debt-service capacity” approach. In contrast to the cost-benefit approach, default is not seen as arising from a calculated cost-benefit analysis, but rather as due to an unintended deterioration of the borrower’s capacity to service its debt. Default then arises from short-term illiquidity or longer-term insolvency manifesting itself in liquidity problems. The result is a breach of the debtor nation’s intertemporal budget constraint, which is then explained by domestic economic factors and/or external shocks. Again a reduced form equation is estimated, relating the occurrence of default to factors causing the inability of a nation to service its debt.

One can argue for the inclusion of many of the same variables in a model pertaining to either of the two approaches outlined above, and indeed many of the factors which drive a country to breach its intertemporal budget constraint also increase the opportunity cost of a nation continuing to meet its debt servicing requirements. Nonetheless, a clear distinction between the two viewpoints of default can be made through consideration of political factors. Political risk will matter under the debt-service capacity approach only in so far as it results in economic mismanagement and hence impacts on debt-servicing ability. In contrast, under the cost-benefit approach politics matters not only through its influence on the ability to pay, but also through its determination of the willingness to meet debt servicing requirements. We discuss this issue further when we address the question of how one can measure political risk.

3. Selection of Variables

Our study is over the period 1980-98 for the list of 81 IBRD borrowers given in Table 1. Data availability then determined the number of countries, and observations per country, which were used in estimation. The dependent variable, denoted Y_{it} , is a binary indicator of whether or not a specific country i is in default to the IBRD in a specific year t , where default occurs when a country enters *nonaccrual* status with the IBRD. Nonaccrual status occurs when a country is 180 days or more late in terms of IBRD debt repayment. The choice of explanatory variables was guided by the theoretical discussion in the preceding section, and by the existing literature on sovereign debt repayment. In particular, Table 1 in Aylward and Thorne (1998, p11) provides a succinct summary of the variables tested in many of the major studies of this literature, and we supplemented the list of variables

given there with other variables suggested by theory. We also consider variables specific to the IBRD in accordance with Aylward and Thorne's finding that Fund-specific variables were important in explaining arrears to the IMF. The list of variables considered is much longer than most of the previous literature, and reflects our desire to attain a robust specification. We discuss the variables pertaining to economic risk, political risk, rescheduling history, and the external environment below, with emphasis on the areas where our choice of variables differs from or develops the existing literature.

3.1. Economic Risk Factors

The choice of economic risk factors in much of the literature on external debt repayment has been guided by the results of an influential study, by Avramovic et al. (1964), of the factors influencing a country's ability to service its external debt. They identify short-term liquidity factors, or traditional debt and financial ratios, and longer-term indicators of economic health and growth. It is possible that despite good, or improving economic fundamentals a developing country may be forced into a liquidity crisis if its reserves are insufficient, or its solvency situation is precarious, and as such these traditional debt ratios are likely to directly influence default. In contrast, structural variables reflecting the long-term economic health of the country are generally not direct causes of default, but countries with poor fundamentals are more likely to develop economic problems that do bring on default. [Dym, 1997] This suggests the need to consider longer time lags of these variables. The literature survey of Aylward and Thorne (1998) suggests that it is the debt and financial ratios that most consistently seem to be significant. They also find past repayment history to be important, but that the inclusion of the lagged dependent variable or other indicators of historical creditworthiness tends to render insignificant many of the other independent macroeconomic variables.

Table 2 lists all the variables used in this study. We group the economic risk factors into four categories: Debt and financial ratios, Resource Availability, Economic Conditions and Structural Factors, and Economic Policy Indicators. Debt and financial ratios pertaining to Official, Multilateral and IBRD Debt are considered alongside the traditional ratios for total debt stock. We discuss the variables that are not transparent or present difficulties of measurement in the next section.

3.1.1. Data on Debt Service Due

Historical information on debt service due is not available in an easily accessible format from any of the standard sources. However projected debt due for the following year is reported annually in the World Debt Tables/Global Development Finance Reports of the World Bank. Prior to 1991 these debt due projections are broken down into Principal and Interest due to Private and Official Creditors; from 1991 onwards one can obtain debt due to Commercial Banks and to Multilateral Creditors. The advantage of these projections is that the information is available annually and takes account of rescheduling agreements. A possible disadvantage is that the projections may be subject to error, and furthermore interest rates changes may mean that debt service due differs from projected debt service due. To investigate the accuracy of the debt service due projections, we compared debt

service paid to debt service due for the non-defaulting countries in our sample. Some countries prepay their debt, hence even in the absence of errors and interest changes we would not expect debt paid and debt due to be the same for all non-default countries. We compared the projections from the World Bank with those of the OECD, and found the latter to not be nearly as accurate. Furthermore, using these projections is, in our view, superior to the approach used by Aylward and Thorne (1998) who add arrears to total debt service paid, which does not allow for debt reschedulings, and adds a stock variable to a flow variable. The result is that their measure vastly inflates the amount of debt service due for countries with large arrears going back in time. It is not surprising, thus, that their measure of debt service due is highly correlated with arrears, and thus “default” which they define in terms of arrears.

In addition to the standard debt service to exports ratios, we consider the ratio of debt service paid to debt service due for total, official and private debt, as explanatory variables. The motivation for considering these ratios is that a variety of factors may make a given debt to exports ratio sustainable in one country, but not in another. Examples include differences in tariff rates, foreign investment and international grants. The debt paid/due ratios enable us to look directly at the ability of a country to service all its liabilities, with a country that is not paying all the amount due to other creditors perhaps more likely to default to the IBRD. We capped the ratio at 100%, as data inaccuracies are responsible for most of the over 100% ratios, and the key information is whether a country is meeting its payments or not, not whether it is prepaying.²

3.2. Political Risk

The creditworthiness of a sovereign nation depends on both the government’s ability and its *willingness* to repay its debt commitments. The economic factors considered above address the ability of a country to repay; political risk addresses the willingness. As Reuss(1996) notes, willingness is a key factor that distinguishes sovereign credits from other types of credits, as creditors have only limited legal redress when, for political reasons, a sovereign government chooses not to repay its debt in time even though it possesses the means. In a cross-sectional study Brewer and Rivoli (1990) examine the effects of politics on perceived country creditworthiness, as measured by country risk ratings, secondary market debt prices and risk premiums charged on sovereign loans. Their results suggest that political variables are at least as important as economic variables in explaining perceived creditworthiness, with regime instability having a stronger impact than either the extent of democracy or the presence of armed conflict, and recent political conditions being more significant than a longer-term political history. In contrast, Lee (1993) uses the same political variables and a different subset of economic variables, and finds that banker’s credit ratings appear to assign larger weight to economic variables than to political instability variables. Nonetheless, they still find the frequency of changes in the regime and armed conflict to have an impact on credit ratings. Both these studies offer only cross-sectional comparisons across countries, and do not investigate the effect of political variables in a panel framework.

² In addition we also tried dividing the data into 0-20%, 20-40%, 40-60%, 60-80%, 80-100% divisions, and using a variable coded 1 through 5 for these divisions, as a further check of accuracy. The results proved robust under this alternative measure.

Brewer and Rivoli (1990) discuss the means by which political risk and instability can affect a country's general creditworthiness. They suggest that unstable regimes divert resources into forms of wealth that are easier to protect than long-term investments, weaken a government's ability to extract the necessary resources from its citizens, and increase investor uncertainty. Furthermore, unstable political conditions can often prevent sound economic management. If the result is that country's with unstable political systems have difficulties attracting external financing, they may be more reliant on the IBRD to obtain funds in the first place. Then if economic conditions force default, if IBRD debt forms a greater share of the portfolio of a more politically unstable country, *ceteris paribus*, default on IBRD debt is more likely to occur. In this circumstance, default on the IBRD debt is not in itself a political act, merely political conditions result in IBRD debt being one of the few forms of external financing available. We examine this hypothesis by considering the interaction between political conditions and the share of IBRD debt, and multilateral debt in general³, in total debt outstanding.

We might expect political factors to have an even stronger impact on a country's decision to default to the IBRD. The IBRD's status as a preferred creditor and its role as a catalyst in attracting financing for countries from other creditors suggest that a country would be likely to emphasize meeting its financial obligations to the IBRD ahead of those to bilateral or commercial creditors. Therefore if default does occur, it may result from a deliberate political act, arising from political tensions between the defaulter nation and the nations with the larger controlling shares in the World Bank. That is nations may be particularly *unwilling* to repay the IBRD, even if they are able to repay some other creditors.

It is likely that political factors therefore impact on both ability and willingness to repay, and we can try and separate the two effects by considering the interaction between political variables and economic conditions. This enables us to distinguish between the cost-benefit and debt-capacity capacity approaches discussed in the theoretical overview.

In recent years there has been a proliferation of data measuring various aspects of governance.⁴ However, the majority of these series are of relatively recent origin, preventing their use in our study. Political Risk Services (PRS) produces the International Country Risk Guide (ICRG), which has compiled monthly data on a variety of political, financial and economic risk factors since 1982.⁵ In addition to a total political risk score, they also provide scores for 12 components of political risk, which are described in Appendix 1. This detailed breakdown of the political risk index enables us to examine which, if any, of the dimensions of political risk have most impact on sovereign default.

³ The argument for considering all multilateral debt is that default to the IBRD may not be considered more detrimental than default to other multilaterals, so that if a country has a high multilateral debt to total debt ratio, it may be more likely to default on a proportion of all multilateral debt, including debt to the IBRD.

⁴ Kaufmann, Kraay and Zoido-Lobaton (1999a) describe a new database containing over 300 governance indicators compiled from a variety of sources. In a related paper (1999b) they utilize a variant of an unobserved components model to combine this information into aggregate governance indicators. As these data series get longer, it may be preferable to use their indices in the model.

⁵ We used data from 1984 onwards due to comparability issues with the 1982-83 data.

3.3. External Conditions

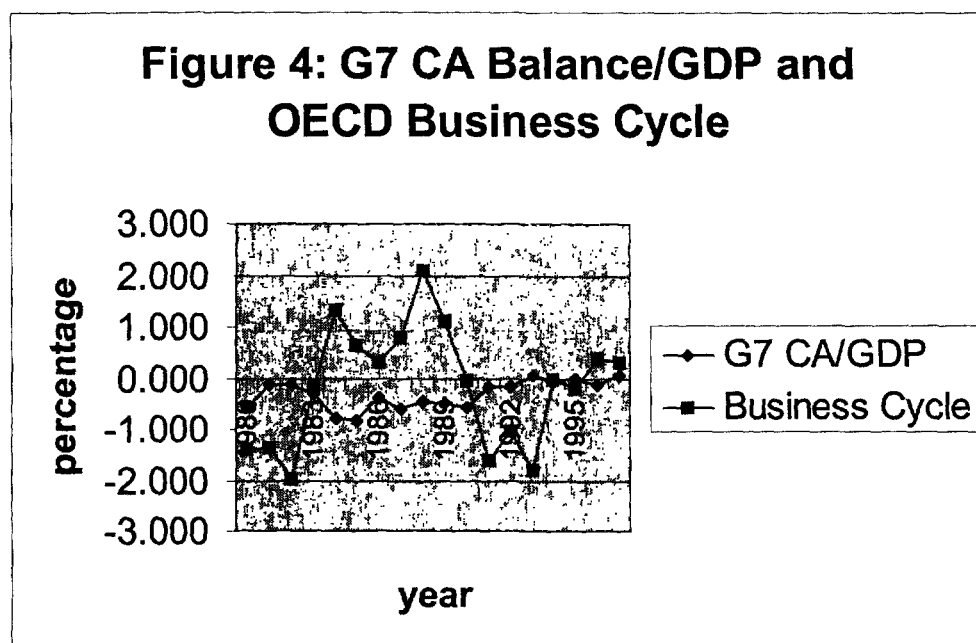
World economic factors, exogenous to an individual developing country, are just as often neglected as political factors in studies explaining sovereign default, yet it is likely they are an important consideration. Cline (1984) considers the role of the global supply of lending, as measured by total net external borrowing by all non-oil developing countries as a fraction of total imports and finds it to have a significant negative effect on the likelihood of an individual country restructuring. A reduction in the global supply of lending, as occurred following the 1982 debt crisis, makes it more difficult for countries to service their debt, whereas a large surge in lending, such as that resulting from petrodollar recycling in the mid-1970s, may prevent reschedulings or defaults that otherwise would have been expected to occur.

In addition to their effect on the global supply of lending, external factors may also impact on repayment costs, through changes in the real LIBOR rates and on a country's exports and per capita income, through world business cycle effects on import demand. Hajivassiliou (1989) considers the volume of import demand by industrialized countries, inflation in the OECD countries, and world interest rates, but finds these variables to have no significant explanatory power after a country's flow of exports and the amount of interest repayments are controlled for. We consider three external economic factors: the three month real LIBOR interest rate⁶, the G7 current account balance⁷ as a percentage of GDP and the deviation of OECD per capita GNP growth from 2%. This last variable is intended to measure the business cycle in OECD countries, with growth appearing to trend around a 2% level. Figure 4 shows the G7 Current Account Balance to GDP and OECD Business Cycle over the sample period. We see the G7 current account deficit increased through the early 1980's, and falls throughout the 1990's. The Business Cycle is indeed cyclical, with lower than 2% growth occurring at the start of the 1980's, followed by a period of faster growth, another decline in the early 1990's, and faster than average growth once more at the end of the 1990's.

⁶ We considered three different deflators of the nominal LIBOR rate: Industrial inflation, the annual percentage change in all developing country Export Unit Values (EUVs), and the annual change in the non-oil developing country EUVs. Deflating by either of the EUVs gives a much more volatile real interest rate series than deflating by industrial inflation, and we find the industrial inflation deflated LIBOR rate to be preferable in our analysis.

⁷ In calculating G7 current account balance/GDP percentages and OECD per capita GNP growth rates we weighted individual country figures by the share of that country's GNP in total G7 or OECD GNP, reflecting the differences in the global importance of individual economies.

Finally one may consider contagion effects resulting from the presence of other countries defaulting. A country's default may make it more likely that other developing countries will default through several channels. Firstly, it may reduce the political costs and reputation effects of defaulting, as other countries are also defaulting. Secondly, once one country defaults, this is likely to have a detrimental effect on the availability of external funds to other developing countries and hence on their debt-servicing ability. We attempt to account for such effects by means of a variable indicating the number of other countries defaulting in the current period.⁸ We use defaults both to the IBRD, and to the Paris Club for this purpose.



Source: World Development Indicators 1999 CDROM, Washington DC, The World Bank.

3.4. Arrears history

Default or nonaccrual on an IBRD loan is said to occur when a country is more than 180 days in arrears on its payments. Before this occurs, loans with arrears exceeding shorter periods also have consequences for countries - for example after 60 days, disbursements are suspended on outstanding loans.⁹ One might suspect that the frequency with which a country goes into arrears of shorter periods could be a harbinger of future defaults, and hence our intention was to include some form of repayments history as an explanatory

⁸ This eliminates the endogeneity problem which would occur if we used total number of defaulting countries in the given year.

⁹ Prior to July 1st, 1991, a suspension warning was issued after 60 days, with disbursements suspended after 75 days, the new cut-off dates are 45 days and 60 days respectively.

variable. However, as of July 1st 1991, changes were made in the arrears policies of the IBRD, and detailed data is only available for the period following this change. Furthermore, for the first few post-change years, poor payment performance was primarily due to information gaps and/or specific institutional bottlenecks, as countries struggled to adapt to the new threshold periods. Consequently the non-default arrears record of a country could not be incorporated into the panel analysis.

3.5. Official and Commercial Debt Restructuring

Given the serious consequences to a country's creditworthiness standing which occurs when it defaults to the IBRD, one might think that countries would first default on loans to other official creditors first. Rescheduling of intergovernmental loans and officially guaranteed private export credits takes place under the aegis of the Paris Club. To make the debt relief effective, debtor countries must sign bilateral agreements with each creditor. One might expect, *a priori*, that such agreements may be an indicator of possible default to the IBRD in the future, both because they represent a worsening debt-servicing ability, and also because the act of defaulting to Paris Club creditors may reduce the supply of credit available, and hence further exacerbate repayment problems. On the other hand, an IMF program must be in place for a Paris Club meeting to occur, a condition of which is no arrears to multilaterals. If the Fund program is successful in improving economic conditions, this may then reduce the likelihood of default. Hence prior rescheduling of official debt may have opposing effects on the probability of IBRD default. Analysis is further complicated by the fact that countries may repeatedly reschedule their debt, rescheduling agreements may treat either the flow or the stock of debt, and the terms and conditions of rescheduling arrangements may vary.¹⁰ These concerns prevent us considering the amount rescheduled as an explanatory variable, and instead we consider the incidence of rescheduling.

Both debt reschedulings and "significant arrears" have been used as the dependent variable in the literature. Cline (1984, p207) notes that "arrears in themselves, especially if minor or temporary, pose no special systemic problem", whereas debt reschedulings "mark a major qualitative break in the spectrum of erosion", and hence represent an appropriate threshold of severity for analysis. Rescheduling worsens a country's credit rating, potentially raising the cost of borrowing, and so countries will not seek rescheduling lightly; instead Cline argues they will be likely to enter into a sequence of arrears, temporary moratorium, and then reschedule only if the opportunity cost of continuing normal debt servicing is perceived to be prohibitively high. We use both reschedulings to Paris Club creditors, and to Commercial Banks in this paper. Concluding and signing bilateral agreements can take one year or more, so than when an agreement occurs, we attempt to resolve the lag between the request for a rescheduling and the eventual signing of such an agreement by appropriate adjustment of the starting date. Feder, Just and Ross (1981) note that there are instances where debt is rearranged or deferred for some length of time without publicity, and including them in the sample without properly considering them as *de facto* reschedulings of debt may distort the

¹⁰ See Table A3.2 in the *Global Development Finance: Analysis and Summary Tables 1999*, The World Bank for a summary of rescheduling agreements and conditions, 1980-98.

estimates. To mitigate this problem we use information on debt restructuring agreements from the Institute of International Finance, in addition to Bank/Fund sources.

We define “default” to Paris Club creditors or to Commercial Banks as a situation whereby a country is unable to meet the current terms of its debt servicing, and hence requires a rescheduling agreement. The general principle for determining the emergence of “default” was to use the contract cutoff date for multilateral debt agreements with official creditors, and the start date of the consolidation period for rescheduling agreements with commercial banks, adjusting these dates as necessary. A country is then said to remain in “default” status until it is able to meet payments on the rescheduled terms without requiring a subsequent rescheduling at the end of the period covered by the current agreement. The exit date for “default” is thus taken as the end date of the period covered by an agreement, provided that it is followed by a immediate period of no rescheduling. For example, Argentina had rescheduling agreements with the Paris Club in 1985, 1987, 1991 and 1992, covering the period from 10 Dec. 1983 through Mar. 1995. We thus treat Argentina as “defaulting” to the Paris Club in 1983, and remaining in “default” status until 1995, rather than treating each separate agreement as an isolated case to be used as the dependent variable. This treatment reflects our belief that the crucial information of interest is when a country first required its debt service to be rescheduled, and the duration of the subsequent period. A country is not deemed to be creditworthy if it is in “default” status.

4. Exploratory Analysis

4.1. Comparison of Means

Table 2 compares the group of countries which defaulted on their IBRD loans, at some time during the sample period 1981-98, with the group of IBRD borrowers which never entered into nonaccrual status. A Welch test for equality of means¹¹ is reported for the explanatory variables used in this study, which allows for the two groups to have different variances. Means are taken over the period 1980-97, as we aim to associate lagged variables with current default. The financial ratios, all the political variables except religion in politics, and rescheduling histories with the Paris Club or with commercial banks all differ greatly across the two groups. Amongst the other categories, we see that reserves to imports, gross national savings to GNP, the current account balance, GNP per capita, inflation, and government revenue and expenditure also have highly significant differences in mean, whereas the two groups of countries do not differ significantly in terms of export ratios, nor in changes in the terms of trade, exchange rate or M2/GDP. GNP per capita growth is significantly different, whereas GDP growth is not, indicating that population growth was higher in the defaulting countries. Wilcoxon rank-sum tests that the two groups are from the same distribution¹² yielded similar results to the tests for equality of means for the majority of the variables considered here

¹¹ There is a case to be made for one-sided tests for many of the variables, given that theory tells us *a priori* the signs of many of the differences. The large magnitude of the t-values for most of the differences in means signifies that this distinction is not important empirically.

¹² Comparison of means may be misleading in the presence of large outliers, hence a comparison of distributions, which includes, *inter alia*, comparison of medians, is a useful complement to the analysis.

These comparisons between default and non-default countries show the key dimensions by which these two groups of countries differ, but tells us little about the changes within a country which lead it to default. The final column of Table 2 gives the correlation between the lagged variables and the dependent variable Y_{it} , our indicator of IBRD nonaccrual status. Thus the correlations look at the relationship between the occurrence of default and the explanatory variables, whereas the Welch tests compare the *group* of defaulting countries to the group of non-defaulters. These correlations fail to account for interrelationships between multiple variables, or across time, but nonetheless provide a first pass at the sign and magnitude of the relationship between the respective variable and IBRD default in the subsequent year.¹³ It is interesting to note that the strongest correlations are between financial variables – Total Debt Service Paid/Due, Total debt/Exports, Total arrears/Total debt and inflation – and default, with some of the political variables also having reasonably strong correlations.

4.2. Correlation and Principal Component Analysis

In order to attain a parsimonious set of predictors we first attempt to identify the main dimensions of the data set through correlation and principal components analysis. With 46 variables to consider, we do not present all the two-way correlations, but instead choose to focus on correlations within different subsets of variables, by grouping the variables into Debt and Financial Ratios, Resource Availability indicators, variables concerning Economic Conditions and Structural Factors in the Economy, Economic Policy Indicators, Political Risk Factors, Rescheduling History and External Economic Conditions. Table 3 reports these intra-group correlations; the only correlation greater than 0.6 between variables in different groups is the correlation of 0.628 between the inflation rate and the exchange rate depreciation, which could just as easily be included in the same group. Only correlations greater than 0.3 are reported in the table, for ease in identifying the key correlations. The most notable correlations between individual pairs of variables are between Total debt service due/Exports and Total debt/Exports (.850), and between Exports/GDP and Imports/GDP (.866). We note that many of the financial ratios show some correlation, and most of the political risk variables are highly correlated with other political risk variables.

To further examine possible multicollinearities, and capture the dimensions of the data, principal components analysis was used. The objective of principal components analysis is to find the unit-length linear combinations of the variables with the greatest variance. Each of the principal components represents an independent dimension of variation. For the full set of 46 explanatory variables it was found that 12 components have eigenvalues greater than one, accounting for 71.49% of the total variability in the data. Table 4A reports the variables with component loadings greater than 0.20 in magnitude. With 46 variables, interpretation of the components is not a simple matter. We see that the first component is essentially a measure of debt, which shows that debt and financial ratios separate the countries most. The second component is a political one while the third

¹³ If we consider the variables as determinants of the *probability* of default, rather than of observed default *per se*, this can explain why the correlations are lower than one might otherwise expect.

measures an external dimension. Interpretation of some of the other components is more difficult, although component 9, representing a depreciation-inflation-money growth component shows that some intuitive dimensions do still arise in the lower components. The bivariate relationships uncovered in the correlation analysis carry through to the multi-dimensional setting, and it appears that grouping the variables may again provide a suitable way to summarize the data. Table 4B reports the results from principal components analysis carried out for the grouped variables.¹⁴ For the most part the components which arise are easy to interpret and make economic sense. We see three dimensions to the Debt and Financial Ratios – the total debt burden, a dimension measuring the type of creditor, which considers the share of official and multilateral debt in total debt, and a debt servicing component consisting of arrears and debt due. Resource Availability consists of a trade dimension, as measured by Exports/GDP and Imports/GDP, and a financial resources dimension, which depends on savings and reserves. The Economic Conditions and Structural Factors group has a growth dimension, as measured by export and GNP per capita growth, and a dimension in per capita GNP and terms of trade changes. For the Economic Policy Indicators, the first component is a government budgetary dimension, while the second component is an inflationary dimension. The Political Risk Factors have three dimensions with roughly equal weights on three or four components, making interpretation of these components more difficult. Finally we see that there is one dimension for rescheduling history and one for the external environment.

This analysis provides important guidelines for variable choice in the analysis, as to avoid multicollinearity problems one would generally wish to not include more than one variable from each component in the model. Furthermore, for variables which do not appear in the final model chosen, this analysis lets us see the extent to which the effect of these variables is captured by other variables included.

5. An Econometric Model of Sovereign Default

The dependent variable, Y_{it} is a binary choice variable which takes the value one if country i defaults on its debt in year t , and 0 otherwise. We use panel data binary choice techniques to model this default. Following Hajivassiliou (1989) one can view the latent variable Y_{it}^* as representing country i 's underlying creditworthiness, which depends upon observable economic and political characteristics and world conditions, measured by a vector x_{it-1} , an unobserved individual country effect, denoted α_i , and an error term u_{it} . We consider only lagged values of the explanatory variables in order to reflect the assumed direction of causation, and hence mitigate simultaneity effects. Furthermore, from a practical perspective, the use of lagged data allows for delays in obtaining the variables needed, and hence is more use for ex-ante creditworthiness assessments. We therefore have:

$$Y_{it}^* = x_{it-1}'\beta + \alpha_i + u_{it} \quad (1)$$

¹⁴ Factor loadings greater than 0.4 are reported, except for the Political Risk variables, where loadings greater than 0.3 are reported.

Then when this creditworthiness, or more precisely propensity to default, exceeds the normalized threshold value of 0, we observe that the country defaults. Thus we have that:

$$Y_{it}=1 \text{ if } Y_{it}^* > 0 \text{ and } Y_{it}=0 \text{ otherwise.} \quad (2)$$

Then by making specific assumptions about the distribution of the error term, u_{it} in equation (1), we can calculate the probability of a default occurring. The use of panel data allows us to control for unobserved individual country characteristics, denoted by α_i , which reflect persistent heterogeneity amongst nations. This may result from differing country characteristics such as colonial histories and political, financial and religious institutions. (Hajivassiliou, 1989). The existence of such unobserved permanent components allows countries which are homogeneous in terms of their observed characteristics to be heterogeneous in response probabilities, and failure to account for these effects can result in biased and inconsistent estimates. A standard issue in panel data econometrics is then whether to treat these effects as fixed or random; we discuss the relative merits of the two approaches.

5.1. The Fixed Effects Logit Model

In the fixed effects model, the country-specific effects are assumed to be fixed, and are thus additional parameters in the model. Chamberlain (1980) shows that maximization of the conditional likelihood function, whereby one conditions on $\sum_{t=1}^T y_{it}$, a minimum sufficient statistic for α_i , yields a consistent estimator of β in the panel logit model. However, a major drawback of fixed effect estimation for our analysis is that only countries for which Y_{it} switches contribute identifying information to the likelihood function, hence estimation excludes all information from countries which did not default at least once during the sample period. Given the sample number of defaulting countries, this has rather severe consequences for sample size.

5.2. The Random Effects Model

An alternative approach is to assume that the incidental parameters, α_i are a random sampling from a $N(0, \sigma_\alpha^2)$ distribution. One can then obtain consistent random effects maximum-likelihood estimates from both the logit and probit specifications of the model.¹⁵ This utilizes information from all the countries in the sample, and hence is preferable to fixed effects analysis for the given data set.

5.3. State Dependence

Heckman makes a distinction between structural and spurious state dependence. He defines *structural state dependence* as indicating that “past experience has a genuine behavioural effect in the sense that an otherwise identical individual who didn’t

¹⁵ Estimation was carried out via the xtlogit and xtprobit commands in STATA, which employ a 12-point Gauss-Hermite quadrature evaluation procedure.

experience the event would behave differently in the future than an individual who experienced the event". [Heckman, 1981, p91] In the context of sovereign default to the IBRD, structural state dependence would occur if a country which had previously defaulted would default again when faced with the exact same economic and political conditions under which a country that had not previously defaulted would not default. This might be the case if the experience of having defaulted once changes the way a country views subsequent default to the IBRD, perhaps as previous default has a permanent influence on creditworthiness reputation. In contrast *spurious state dependence* occurs when "individuals differ in certain unmeasured variables that influence their probability of experiencing the event, but that are not influenced by the experience of the event. If these variables are correlated over time, and are not properly controlled, previous experience may appear to be a determinant of future experience solely because it is a proxy for such temporally persistent unobservables". [p91-92] The omission of political considerations in many previous studies would be one such occurrence.

These considerations mean that it is important to test for true versus spurious state dependence in order to determine whether a dynamic model is appropriate. Testing is complicated by the possible presence of heterogeneity, represented by the α_i terms. Even if there is no state dependence, as long as there are individual effects in the model it will be the case that $\Pr(y_{it}|x_{it}, y_{it-1}) \neq \Pr(y_{it}|x_{it})$. Baltagi (1996) suggests that one first run the pooled logit model, and test whether $\gamma=0$ in the model $\Pr(y_{it}=1 | x_{it}, y_{it-1}) = F(x_{it}'\beta + \gamma y_{it-1})$, where $F(\cdot)$ is the cdf of a logistic distribution. If the null hypothesis that $\gamma=0$ is not rejected, then we can proceed with the pooled logit model and ignore the panel nature of the data. Rejection of the null may occur due to serial correlation in the error term arising from individual effects, or from state dependence. Hsiao (1982) then outlines a simple test for state dependence, due to Chamberlain, which is based on whether or not there is a dynamic response to an intervention. After conditioning on the individual effects, α_i 's, one includes lagged x 's without lagged y 's in the model, and tests the null of no state dependence by testing whether: $\Pr(y_{it}=1|x_{it}, x_{it-1}, \dots, \alpha_i) = \Pr(y_{it}=1|x_{it}, \alpha_i)$. Rejection of the null indicates that there is state dependence, and hence the need to include lags of the dependent variable in the model.

The distinction between spurious and true state dependence is not just a question of econometric niceties. In their literature survey Aylward and Thorne (1998, p14) find that "past repayment history has been found to be significant in every study in which it has been tested". It is important to test, therefore, whether this merely reflects the omission of important variables from all such studies, or whether countries default behaviour does in fact change once it enters nonaccrual status.

5.4. Measures of Fit

Several measures are often used in the literature to evaluate the fit of binary choice models. One measure often reported is the pseudo- R^2 , given by the formula:

$pseudo-R^2 = 1 - \frac{L(\hat{\beta})}{L(\tilde{\beta})}$ where $L(\hat{\beta})$ is the log-likelihood evaluated at the MLE estimate

$\hat{\beta}$ and $\tilde{\beta}$ is the MLE in the constant only model. The pseudo- R^2 has the properties that: pseudo- $R^2 \in [0,1]$, the larger the contribution of the bona fide variables to the maximum of the likelihood function, the closer is pseudo- R^2 to unity, and it stands in one-to-one relation with the chi-squared statistic for testing the hypothesis that the coefficients on all variables apart from the constant are jointly zero.[Dhrymes, 1986] Another measure of statistical performance is the Chi-squared statistic for overall significance, which tests the joint significance of all variables in our model. For all models reported in this paper this test rejects the null hypothesis of joint insignificance.

The best indicator of the models performance is its degree of success in predicting the occurrence and absence of default. The estimation process yields predicted probabilities for each country. To translate these into predictions about default it is necessary to choose a threshold probability P^* above which a country is predicted to default and below which no default takes place. Type I error occurs when for a particular country a year is incorrectly classified as a nondefault case, whereas in fact default did take place. Type II errors are those errors where a nondefault case is incorrectly classified as a default case. Cline (1984) suggests that the critical threshold should be chosen so as to minimize total error subject to a relatively equal percentage rate of error across the two types. He finds that a threshold level of 0.041 to best achieve this balance, and attributes the low level to the large imbalance between nonrescheduling and rescheduling cases in his sample¹⁶. This high propensity of nonevent cases also characterizes our sample, and we hence expect that similarly low threshold probabilities will be needed. We use a threshold of 0.05 for the majority of our study, but report the results from using other levels where appropriate. As a practical matter, countries with predicted values slightly less than this threshold can be considered as belonging to a “watch group” of at-risk countries, and such countries should be examined more closely.

5.4.1. Interpretation of the Threshold

In our sample of 675 observations we have 41 defaults to the IBRD. Thus the sample mean probability of default is $41/675 = 0.06$. A 95% confidence interval for the mean probability of default is (0.04, 0.08). Thus if the estimated probability of default is above 0.08, we are 95% confident that the country is more likely to default than a country chosen at random in the sample. Reflecting our concern with Type I over Type II errors we choose 0.05 as the threshold cutoff point, which enables us to detect relatively more defaults.

¹⁶ Cline’s sample contained 97 percent nonrescheduling cases and 3 percent rescheduling cases.

6. Econometric Results

6.1. Results for IBRD Estimation

6.1.1. The Panel Logit Model of Default

Table 5 presents the panel logit estimation results for default on IBRD loans. We first present the saturated model, which contains at least one element from each of the principal components found, and covers the main variables found in the literature. Only 58 countries had data available for the full set of variables considered. We see that the lagged default term is the most significant explanatory variable, and we thus reject the joint null of no state dependence and no heterogeneity. The estimated coefficients for the pooled logit and random effects logit are equal for the saturated model, a result of the extreme overfitting here. The second and third columns of Table 5 give the estimates, for the pooled logit and random effects logit respectively, for the preferred sub-model of this saturated model. A likelihood ratio test does not reject the submodel in favour of the saturated model. We consider only the Government Deficit/GDP percentage in our final model as a Chi-squared test of the null hypothesis that the Government Revenue/GDP and Government Expenditure/GDP percentages have equal and opposite effects on the propensity to default could not be rejected. In this submodel we see that the proportion of the total variance contributed by the panel-level variance, denoted ρ , is 0.10, and a chi-squared test does not reject that $\rho=0$. Thus the random effects and pooled estimators do not differ greatly, and efficiency concerns therefore dictate that one should use the pooled logit estimator. Thus any country heterogeneity is captured by the lagged dependent variable and the other explanatory variables.

Chamberlain's test for state dependence was carried out for both the saturated and the submodel, using random effects estimators to condition on any individual country effects. In both cases we overwhelmingly reject the null of no state dependence, and hence need to include the lagged dependent variable in our model. The interpretation of this is that a country which has defaulted in the previous period exhibits different default behaviour to one that hasn't, *ceteris paribus*. This reflects not just the fact that a country in default will have built up IBRD arrears, which it must pay back to exit default, but also that once a country enters default, it suffers the reputational and creditworthiness consequences of this action, with a further year in default having a much smaller impact on creditworthiness perceptions than does entering into default.

The submodel shows that default to the IBRD can be modeled parsimoniously through six explanatory variables, all of which are significant at the 90% level. A country is more likely to default on its IBRD debt if it defaulted in the previous period, if it has a large private arrears to total debt ratio, and if it has been paying only a small proportion of its *total* debt service due in the preceding period. These latter two debt ratios show that a country's debt-servicing performance with other creditors impacts on its ability to meet IBRD obligations. A large budget deficit relative to GDP makes a country more liable to default to the IBRD, reflecting the effects of a sovereign's demand for borrowing. Politics matters, especially the extent of military involvement in the politics of a country.

Unsurprisingly a country is more likely to default involving a coup d'état.¹⁷ The final factor to have an effect is the G7 Current Account Balance/GDP ratio, reflecting the importance of the global environment on sovereign default. Theoretically this ratio represents both the demand by G7 countries for other nations' exports and also the supply of funds available from G7 countries. We find a greater G7 current account surplus relative to GDP to reduce the probability of default. This indicates that the liquidity effect, whereby more global funds are available for borrowing, dominates any effect from a reduction in exports on the propensity to default. In the data we see this through a close association between the real LIBOR rate and the G7 Current Account/GDP ratio¹⁸ – omitting the G7 CA/GDP ratio results in a significant positive coefficient on the real LIBOR rate. The small trade effect also reflects the fact that the majority of G7 imports originate from developed countries, so that the effect of changes in the Current Account surplus on developing country exports may be of second order.

In the final column of Table 5 we report standardized coefficients from the pooled logit submodel. In a logit model, the effect of a unit change in one of the regressors depends on the levels of all the regressors, so we standardize the coefficients by evaluating the partial derivative at the mean probability level in the sample. That is the standardized

coefficients are $\frac{\partial p}{\partial x_k} = \bar{p}(1 - \bar{p})\beta_k$. The mean probability level in our sample is 0.0607,

which is very close to our cutoff threshold of 0.05. Thus the standardized coefficients reflect the effect of a change in the regressor for a country which is a border-line default case on the estimated default probability. Thus, for example, an increase in the budget deficit by an extra 1% of GDP increases the probability of default by 0.0046 at the mean. The range of the various regressors varies, but for each variable a change in one standard deviation of the variable has an impact on the default probability of approximately 0.05 in magnitude.

We report the within sample fit for a range of cutoff probabilities, and see that in accordance with the findings of Cline(1984), a low threshold probability is to be preferred in order to balance Type I and Type II errors. Over a range of models, a threshold of 0.05 seemed reasonably robust, and we suggest this be used, with countries with probabilities in the 0.03-0.05 range examined on a case-by-case basis. We see that with a 0.05 threshold, the Type I error is 4.88% and the Type II error is 8.68%, which indicates a good within sample fit. We then reestimated the model using only defaults which occurred prior to 1994, using this model to examine the out-of-sample fit over the period 1994-98.¹⁹ The results are reported at the bottom of Table 5 and indicate the model performs well over this period.

¹⁷ Stronger overall politics, as measured by the total political index, lessens the likelihood of default, but once the military variable was included the overall effect was insignificant.

¹⁸ The correlation between the G7 current account balance/GDP and the real LIBOR rate was -0.551.

¹⁹ Of course this is not a true test of out-of-sample fit as we have already used the data from 1994-98 in our model selection process. However the scarcity of defaults precludes withholding these observations from all stages of the estimation process, and the analysis carried out here at least indicates that the model is stable over this period.

6.1.2. Model Robustness

None of the other variables listed in Table 2 had a significant coefficient when added to the model above, nor were further lags of the dependent variable found to be significant. Of the financial ratios, the total debt service paid/total debt service due variable was the only significant variable. Debt service due to exports or GNP ratios were not significant. To test whether some of the structural factors, such as GNP per capita and growth rates were having an effect over a longer time frame, lags of one to five years of these variables were tried, and all resulted insignificant. The number of other countries in default in a given year, as an indicator of contagion, was also insignificant. Likewise the number of countries in default to the Paris Club in the previous year was insignificant. We tested for an interaction between the political score and the share of multilateral or IBRD debt of total debt and could not reject the null hypothesis of no interaction. This suggests that politics has a direct effect on default, rather than merely through its influence on the sources of financing a country can obtain. Throughout the addition of these variables, the coefficients of the model in Table 5 maintained their sign, significance, and generally their magnitude, indicating the model to be robust to alternate specifications.

6.1.3. Modeling without the lagged dependent variable:

In light of the small number of economic variables found in the preferred model fitted, it is of interest to examine if this is a result of the lagged dependent variable capturing all the pertinent information in these variables. To investigate this further, Table 6 shows the results of fitting a model without the lagged dependent variable. We see many of the variables are the same as in the preferred submodel in Table 5. Additionally we now find the total IBRD Debt stock/Exports to have a positive impact on the likelihood of default, total political risk rather than the involvement of military to be more important, a positive impact from the real LIBOR rate, and from the OECD Business Cycle. We see that as expected, the fit of this model is not as good as for the model which conditions on the lagged dependent variable, with the model giving large Type I errors. Again the Chamberlain test for state dependence strongly rejects the null of no state dependence, invalidating this model.

6.1.4. Fixed Effects Model

As noted, the use of fixed effects means that all observations on countries which do not change their default status at least once during the sample period are dropped. The result is that the model is estimated for only the 14 defaulting countries for which we have sufficient data. The variables included in the model were the lagged dependent variable, share of total debt service due which is paid, the share of short-term debt in total debt, the ratio of total IBRD debt stock to exports and the OECD Business Cycle. The fit of the fixed effects model was much poorer than that of the random effects model, with large Type I errors in particular, and hence suggest that the random effects models, which utilize all of the data, are preferable.

6.1.5. Treatment of IDA Reverse Graduates & Fifth Dimension Recipients

One of the criteria used to determine a country's eligibility for IDA funds is lack of creditworthiness for IBRD funds. Thus the question arises as to how one should treat IDA-eligible nations with outstanding IBRD loans, since these countries are by one measure already deemed IBRD uncreditworthy. The approach used above is to treat them in the same way as other IBRD borrowers, since we are still interested in the likelihood that these countries default. However, with countries which "reverse graduate", whereby they become reeligible for IDA credits due to a drop in per capita GNP and other events, it may be argued that if it were not for their access to IDA funding, these countries would default on their IBRD loans. If so, we may consider reverse graduates as additional defaults for the purposes of modeling. Table 7 reports the results from combining reverse graduates with IBRD defaulters. The problem is that there are then more reverse graduate country-year observations than actual defaults, and the model becomes more one of modeling reverse graduates. Thus we find unsurprisingly GNP per capita and export growth to be important, whereby for modeling defaults alone they were not. Thus this approach does not appear to be a fruitful one, although it does indicate that IBRD defaulters and Reverse Graduates do not form a homogeneous pool.

Another aspect of this is the use of so called Fifth Dimension Funds, whereby IDA reflows are used to cover the IBRD debt service interest payments for IDA-only countries. Under the Fifth Dimension, IDA supplied about \$1.0 billion for SPA²⁰ countries to pay off IBRD debt, with donors contributing another \$0.2 billion. Many of these recipients were IDA countries that received enclave loans, which are now being amortized, so the role of Fifth Dimension funding may diminish in the future. Nevertheless, historically it may have been important in preventing IBRD default, and there may be lessons from this experience which can be applied to other forms of debt relief. Thus there is a case to be made for considering carefully these countries also as defaulters. This has not been done in the present study due to time delays in obtaining historical records of Fifth Dimension recipients, but may provide an avenue for future refinement of this model.

6.1.6. Modeling IBRD Default 5-years in advance.

The analysis in this paper attempts to ascertain the determinants of default one year in advance. With good forecasts of the regressors one can use the resulting models to determine default several years in advance, but the political variables, in particular, may be difficult to forecast, and macro forecasting beyond two to three years can be very inaccurate. Nonetheless, the relatively long maturity of IBRD loans makes it necessary to determine future creditworthiness beyond a one or two year horizon. In Table 8 we report random effects panel logit estimates used in modeling default to the IBRD as a function of variables lagged five years. We use the annual average growth in per capita GNP over

²⁰ Special Program of Assistance (SPA) was launched in 1987 as a donor-coordinated response to the Africa continentwide debt and development crisis. The Eligibility criteria for SPA are 1) low-income, in terms of IDA eligibility, 2) debt distress, in terms of a debt service ratio of 30% or more, and 3) an adjustment program supported by the IMF and IDA. See the SPA website at <http://afr.worldbank.org/aftk1/spa1.htm> for more information on the SPA.

the past five-year period to reflect the fact that GNP growth is one of the most common forecasts, so one could use forecasts of average growth over a five-year period, and the idea that it is cumulative growth over a medium term period which is important. Business cycles may differ across countries both in terms of amplitude and period, so using smoothed growth rates rather than one-year rates may be preferable for medium term analysis. We note firstly that a random-effects model is needed, with panel level variation much more important in the five year model than when we use one-year lags. This reflects the fact that country heterogeneity, or country-specific shocks, have an important impact on default probabilities when one looks five years into the future. According to the model, a country is more likely to default in five years time if it has a low savings to GNP ratio, a large budget deficit, high total political risk, is currently paying a low portion of its debt service due, and has low expected average growth over the next five years. These results easily accord with our intuition. In contrast, we also find that for a given level of these other variables, a current high level of debt to exports, and current high arrears to private creditors makes a country *less* likely to default to the IBRD in five-years time. This may reflect the influence of IMF stabilization programs in place following default to other creditors. Given these variables, the default status at time $t-5$ was not a significant determinant of default at time t . When we examine the within sample fit of the model, we see that we need an extremely low cutoff threshold, of 10^{-7} , to achieve a roughly equal proportion of Type I and Type II errors, which are still 28% and 23% respectively. In common with other models in this paper, many of the Type I errors were for one particular country in which it is often thought default was more a matter of unwillingness to pay.

The results, therefore, show that it is difficult to predict default five years into the future. Economic and Political conditions may change quite dramatically over this time, and the use of the explanatory variables lagged five years does not take such changes into account. Table 8 shows the correlations between the fifth and first lags of the explanatory variables, and while quite high in some cases, it is the observations that change which may account for a change in default status. As such one would wish to consider forecasts in the model where possible, although historical records of forecasts may be hard to obtain for some variables, making panel data studies difficult. Moreover given the vast number of different economic forecasts made for the same variable, the question as to which forecast to use when modeling needs to be addressed. An alternative approach may be to use a more structural model, whereby one explicitly models the build-up in debt and lowering of reserves as a function of structural factors such as GNP per capita growth rates, terms of trade movements, the inflation rate and other such variables. One would then have default depending on this latter group of factors through their impact on our debt and financial ratios.

6.2. Results for Paris Club Default Estimation

Table 9 reports the results of using panel logit analysis to model the likelihood of default to Paris Club creditors. We note firstly that there is a much higher incidence of default to the Paris Club than to the IBRD, as was shown in Figure 3. Of the 673 country-year observations in the saturated model, there are only 40 IBRD defaults, as compared to 260 Paris Club default observations. We run exactly the same saturated model as we did for IBRD defaults, but using defaults to the Paris Club as the dependent variable. The pooled

and random effects logit estimates are once again identical to each other, but we see more variables show up as significant in this saturated model than in the IBRD case. A test of $\rho=0$ did not reject the null in the submodels either, and we hence report only the pooled logit estimates for the submodels. It appears that any heterogeneity amongst countries is controlled for by the explanatory variables used in these models.

In the third column of Table 9 we report our preferred model for Paris Club default, which was exhaustively tested against alternatives following the steps used in modeling default to the IBRD. The resultant model includes several of the variables most often found to be significant in the literature. We find that the higher a country's short-term debt as a percentage of total debt, the higher its total debt stock relative to exports, the greater its arrears to private creditors, and the lower its reserves relative to imports the more likely the country is to be in default to Paris Club creditors. These financial variables show that it is not just total debt, but also its composition which is important to creditworthiness. The strongest effect is once again the rescheduling history, reflecting state dependence once again. More exports relative to GDP and less imports relative to GDP have a weak effect on reducing the likelihood of default. We find two external variables to have highly significant effects on the likelihood of default to Paris Club creditors. In common with the IBRD default model, a G7 current account surplus, reflecting increased liquidity, lessens the chance of any country defaulting. Secondly, we also find that an increase in the real LIBOR rate raises the likelihood of default to Paris Club creditors. This effect is closely related to the current account effect, although both variables show up as significant in the model. On the political front, we once again find that greater involvement of the military in politics raises the likelihood of default, but this effect is offset to a degree by the total political score. For a given level of military involvement, a reduction in total political risk actually increases the likelihood of default. This somewhat counterintuitive result reflects the fact that we measure Paris Club default by means of rescheduling agreements, which require both an IMF program and negotiations with multiple creditors. An unstable political system may prevent these from occurring, reducing the probability of a default being *measured*. This suggests that one may wish to supplement Paris Club rescheduling data with arrears data to obtain a more inclusive definition of Paris Club defaults.

The higher incidence of default indicates that we should use a higher cutoff threshold for determining predicted default, and we suggest 0.30 to be an appropriate level. Again this is set at a level slightly below the sample mean incidence of defaults, reflecting a greater concern with Type I errors. The within sample type I and type II error rates are both low, at 5.4% and 6.5% respectively, suggesting this model provides a good fit in determining creditworthiness to Paris Club creditors.

6.3. Results for Commercial Bank Default Estimation:

Following our estimation of the determinants of default to Paris Club creditors, we now turn our attention to Commercial Bank lending. Once again we do not reject the hypothesis of no random effects, and hence Table 10 reports the pooled logit estimates used to model default to this group of creditors. We see that in common with the Paris Club default models, the saturated model has a lot more significant variables than in the

case of IBRD default. In column 2 we report the estimates for the preferred model for modeling the likelihood of default to Commercial Banks. We see that financial, political and external variables all have strong effects on the propensity to default to Commercial Banks. The financial variables all take the expected signs: a country with high private arrears relative to total debt, high short-term debt and a low proportion of private debt service due being paid is more likely to default. Again the lagged dependent variable is the most significant term. We see several dimensions of political risk have an impact on defaults to Commercial Banks – a lower investment profile score, a greater involvement of the military in politics, and poor law and order all make a country more likely to default to Commercial Banks. This interpretation is complicated by the positive sign on the total political risk index, which serves to reduce the joint effect of these three components. The overall political effect is still that greater political risk increases the likelihood of default. In common with the IBRD and Paris Club models the G7 Current account surplus relative to GDP has a negative impact on the propensity to default. Again using a 0.30 cutoff threshold for determining default, we see that this model is the best fit of the three creditor groups, with Type I errors of only 3.2% and Type II errors of 6.2%.

6.4. Comparison of Models

6.4.1. Using Paris Club and Commercial Bank models to model IBRD default:

In Table 11 we compare the preferred IBRD default model to the results from using the preferred models for Paris Club and Commercial Bank default to model IBRD default. We see that scarcely any of the variables which were significant when used in modeling default to the other creditors show up as significant when we turn our attention to modeling default to the IBRD. The predicted default probabilities are highly correlated with those from the preferred IBRD model, but in terms of Type I and Type II errors the models for the other two creditor groups do worse.

We see therefore that different models are needed to model default to the three types of creditors, but that all three models contain financial, political, and external variables. All three models contain the lagged dependent variable, indicating that state dependence is important, arrears to private creditors, the extent of military in politics, and the G7 Current Account/GDP ratio. All three models also contain one further debt ratio variable, although the actual variable differs across models. It is noticeable that the government budget deficit/GDP ratio is important for modeling default to the IBRD, but not to the other creditors. This may reflect the increased reluctance of nations to default to the IBRD, compared to the other creditor groups, so that a government will use its resources to meet IBRD payments if at all possible. In our sample only three default observations had budget surpluses in the year prior to default, with only a sole case of a country entering into default with a budget surplus.

These results therefore indicate that some of the same underlying factors are influencing sovereign default in each case, but the variables through which these underlying influences best manifest themselves differ to some degree across creditors. This suggests that one may wish to try using the principal components found, instead of the individual

ratios, in order to attain a common set of factors explaining all three classes of default. However, the downside of this is that interpretation becomes less clear, and as transparency is an important consideration in determining risk ratings, this approach may not be suitable. The familiarity of ratios such as debt service to exports, or reserves to imports, means that a model based on such factors is more easily understood by its users.

6.5. Modeling IBRD Default as a Two-Step Process

The above analysis models default to each creditor group separately. However, the preferred model for IBRD default contains the extent of arrears to private creditors, and the repayment performance to all creditors as explanatory variables, demonstrating a link between default to other creditors and default to the IBRD. In this section we examine this link more closely, to ascertain whether there is evidence for a creditor hierarchy, whereby countries first default to Commercial Banks and Paris Club creditors, and then subsequently default to the IBRD. One would like to then determine which factors are most important in driving countries to take the additional step of defaulting to the IBRD.

We consider two different approaches to examine this hypothesis. Firstly we use the predicted probability of default to Commercial Banks²¹ in year t as an explanatory variable in the panel logit analysis of IBRD default in year t . The resulting model then shows the additional factors in year $t-1$ which impact on the probability of default to the IBRD. Models A1 and A2 in Table 12 report the results of this analysis. We find a random effects logit model is necessary to account for country heterogeneity, and that once again state dependence is important, resulting in the inclusion of the lagged dependent variable in Model A1. As one would expect, the likelihood of default to the IBRD is strongly positively related to the estimated probability of default to Commercial Banks. Additionally a lower share of official debt service due being paid increases the probability of default, representing the effect of official creditor default in addition to Commercial Bank default. The only other factors to have a significant impact are both political variables, showing that external conflict and a high involvement of military in government have greater effects on IBRD default. In Model A2 we omit the lagged dependent variable, and find that countries in which IBRD debt forms a larger share of the total debt, and countries with more short-term debt, are more likely to default.

The second approach we use to examine the plausibility of a default hierarchy is to restrict our sample to consider only countries which are in default to either Commercial Banks and/or Paris Club creditors in year $t-1$ in modeling default to the IBRD in year t . In model B1 we see that nations with a high share of IBRD debt in total debt, high short term debt, a low share of official debt service due being paid and high government consumption relative to GDP are more likely to default to the IBRD having already defaulted to other creditors. Once again there is state dependence, so the lagged dependent variable matters, and politics matters. Countries with poor law and order and a large involvement of military in politics are more likely to default to the IBRD. If we omit the lagged dependent variable we see that a higher total arrears to total debt ratio is

²¹ The correlation of 0.64 between the predicted probabilities of default to Commercial Banks and to Paris club creditors meant that both predicted probabilities could not be used as significant regressors in the logit analysis. We used predicted defaults to Commercial Banks as this gave a closer fit.

additionally important. We report type I and type II errors for both a 0.05 cutoff, and a 0.10 cutoff, the latter being preferred in this case as it is approximately the sample mean default propensity.

A cursory examination of the IBRD default history shows that countries typically²² default to other creditors before defaulting to the IBRD; this analysis enables us to understand more clearly why certain countries do not continue into default to the IBRD, whereas others do. Together with the results of the previous section, these results therefore do provide evidence of a graduated hierarchy of default, whereby nations first default to other creditor groups, and then only default to the IBRD under more severe circumstances. A country with a high share of short-term debt and IBRD debt will clearly find it harder to make its IBRD payments, and together with unfavourable political circumstances, such as a heavy military presence and external conflict, this will increase the chances of subsequent default to the IBRD.

7. Conclusions

The small number of cases of IBRD nonaccrual and their seemingly idiosyncratic, political nature have led several observers to conclude that one can simply not model IBRD default. This study provides some ammunition against this viewpoint, and shows that while modeling can be difficult, it is possible to identify key economic, political and external variables which impact on the likelihood that a country will default to the IBRD. The results provide evidence of a graduated hierarchy of defaults, whereby countries in trouble first default to Paris Club and/or Commercial Bank creditors, and only then default to the IBRD if circumstances are particularly unfavourable. Default to the IBRD is thus a distinct, but related, phenomenon to default to other creditor groups.

The relatively larger number of defaults to Paris Club and Commercial Bank creditors enables one to discern the effects of more variables than is possible with IBRD default, and to obtain more accurate within sample fits. For both creditor groups the within sample Type I and Type II error percentages were in the order of 5-6%, which compares favourably with much of the literature in this area. The resulting models of default contain many of the standard ratios considered in country-risk analysis, such as Total Debt/Exports, Reserves/Imports, Private Arrears/Total Debt Stock, Short-term Debt/Total Debt Stock, Exports/GDP and Imports/GDP. In addition, political and external factors, including the investment profile, the extent of military involvement in politics, the real LIBOR rate and the G7 Current Account Deficit/GDP, also impact on the probability of default.

We modeled IBRD default both separately, and through a two-step process whereby we first considered default to other creditors, and examined the factors which result in subsequent default to the IBRD. In both cases we arrive at a parsimonious model of IBRD default in which a country is more likely to default if it has severe problems with other creditors, as measured by high private arrears and a low debt service paid/due ratio,

²² The only cases of default to the IBRD without “default” to other creditors are for two countries which did not obtain IMF Programs, and thus could not undertake Paris or London Club reschedulings. Nevertheless these countries stopped paying their other creditors, and a better definition of default would capture this.

if it is running a large budget deficit relative to GDP, and if it has a high military presence in government, reflecting unfavourable political conditions. The two-step process finds that countries with a high share of their debt in the form of short-term and IBRD debt are also more likely to default to the IBRD. In common with defaults to other creditors, we find a G7 current account surplus to lower the probability of default. This surplus represents the availability of capital flows from G7 countries, and lowers the probability of default by both increasing the supply of funds available, and lowering the real LIBOR rate and hence costs of those funds. This demonstrates that for an IBRD borrower, the liquidity effect of a G7 current account surplus outweighs any effect of reduced exports to the G7 economies, at least in terms of its impact on the likelihood of default.

A larger budget deficit relative to GDP increases the likelihood that a nation will default to the IBRD, but was not a significant determinant of default to the other creditor groups. The greater seriousness of default to the IBRD means that a government will not default to the IBRD while running a budget surplus, but rather would use those resources to meet the necessary repayments. In contrast, payments to other creditors may not have such a high priority in the government budget.

State dependence was found to be important in modeling default to all three creditor groups. Tests revealed true state dependence, whereby a country which enters into default changes its behaviour, so that it may continue to default when faced with economic, political and external conditions identical to those under which a country which has not previously defaulted will not default. This reflects not just the build-up in arrears which a country must repay to exit nonaccrual status, but also the idea that the reputational costs of default are mainly incurred when default occurs. The reputational and creditworthiness consequences of an additional year of default, once default has already occurred, are likely to be of second order, and the country may choose to stay into default until it can exit under the most favourable conditions possible for it.

Structural factors and the longer-term economic outlook do not significantly impact on the likelihood of default one year in advance. We do not find export and GNP per capita growth rates, the inflation rate, or the level of per capita GNP to be a significant determinant of default in any of our short-term models. The five-year average growth rate and the gross national savings rate are important once we model default five years into the future, however modeling default is much less accurate over this horizon. The inherent unpredictability of political events over longer horizons compounds this problem. Operationally the Bank can not change its exposure, or write loan contracts, for one-year intervals, so ideally one would wish to predict future creditworthiness over longer horizons.

References:

- Avramovic, Dragoslav, et al. 1964. *Economic Growth and External Debt*. Baltimore: Johns Hopkins Press.
- Baltagi, Badi h. 1995. *Econometric Analysis of Panel Data*. New York: John Wiley & Sons.
- Brewer, Thomas L and Pietra Rivoli. 1990. "Politics and Perceived Country Creditworthiness in International Banking", *Journal of Money, Credit and Banking*, 22(3): 357-369.
- Chamberlain, Gary. 1980. "Analysis of covariance with qualitative data", *Review of Economic Studies* 47:225-238.
- Cline, William R. 1984. *International Debt: Systemic Risk and Policy Response*. Institute for International Economics.
- Dhrymes, Phoebus J. 1986. "Limited Dependent Variables", pp1568-1631 in Zvi Griliches and Michael Intriligator ed. *Handbook of Econometrics Volume III*. New York: North-Holland.
- Dym, Steven. 1997. "Credit Risk Analysis for Developing Country Bond Portfolios". *The Journal of Portfolio Management*. 23(2):99-103.
- Feder, Gershon and Richard E Just. 1977. "A Study of Debt servicing capacity applying logit analysis". *Journal of Development Economics* 4:25-38.
- Feder, Gershon, Richard Just and Knud Ross. 1981. "Projecting Debt Servicing Capacity of Developing Countries". *Journal of Financial and Quantitative Analysis* 26(5):651-669.
- Hajivassiliou, Vassilis A. 1994. "A Simulation Estimation Analysis of the External Debt Crises of Developing Countries", *Journal of Applied Econometrics*, 9:109-131.
- Hajivassiliou, Vassilis A. 1989. "Do the Secondary Markets Believe in Life After Debt?", *World Bank Policy, Planning, and Research Working Paper No. 252*. The World Bank.
- International Monetary Fund. February 1998. *Official Financing for Developing Countries*. Policy Development and Review Department: IMF.
- Kaufmann, Daniel, Aart Kraay and Pablo Zoido-Lobaton. 1999a. "Governance Matters", World Bank, mimeo.
- Kaufmann, Daniel, Aart Kraay and Pablo Zoido-Lobaton. 1999b. "Aggregating Governance Indicators", World Bank, mimeo.
- Lee, Suk Hun. 1993. "Relative importance of political instability and economic variables on perceived country creditworthiness". *Journal of International Business Studies* 24(4):801-812.
- McFadden, Daniel, Richard Eckaus, Gershon Feder, Vassilis Hajivassiliou and Stephen O'Connell. 1985. "Is There Life after Debt? An Econometric Analysis of the Creditworthiness of Developing Countries" pp 179-209 in Gordon w. Smith and John f. Cuddington ed. *International Debt and the Developing Countries*. Washington, DC: World Bank.
- Reuss, Konrad. 1996. "Trends in Sovereign Ratings". *The World of Banking*. 15(1):12-14.
- Ul Haque, Nadeem, Manmohan S. Kumar, Nelson Mark and Donald J Mathieson. 1996. "The Economic Content of Indicators of Developing Country Creditworthiness", *IMF Staff Papers* 13(4): December 1996.

Appendix 1: Principal Sources of Data Used:²³

Global Development Finance 1999 CDROM

Total Debt Stocks (EDT).
Total Debt(EDT)/Exports of goods and services (%)
Total Debt(EDT)/GNP (%)
Interest arrears, Official creditors
Interest arrears, Private creditors
Principal arrears, Official creditors
Principal arrears, Private creditors
Short-term Debt/Total debt (EDT) (%)
IBRD Debt Outstanding and Disbursed (DOD).
PPG, Official Creditors – DOD and TDS.
PPG, Private Creditors – DOD and TDS.
Multilateral Debt/Total Debt (EDT) (%)
Debt Service, total long-term
Reserves/Imports of goods and services (months) – together with data from *World Development Indicators 1999 CDROM*.
Exports of Good and Services
Exports of goods and services (% of GDP)
Exports of goods and services (annual % growth)
Imports of goods and services (% of GDP)
Gross national savings, including NCTR (% of GNP)
Current Account Balance (% of GDP)
GNP per capita (constant 1995 US\$)
GNP per capita growth (annual %)
Gross National Product (US\$)
GDP growth (annual %)
Terms of Trade adjustment (constant LCU)
Inflation, consumer prices (annual %) – together with data from IMF *International Financial Statistics*.
Expenditure, total (% of GDP)
Current revenue, excluding grants (% of GDP)
General government consumption (% of GDP)

World Development Indicators CDROM 1999

Exchange Rate – Local currency units per US\$ (annual average).
Money and quasi money (M2) as % of GDP
For the OECD & G7 Countries:
GNP per capita growth (annual %)
Current account balance (% of GDP)
GNP at market prices (constant 1995 US\$)

IMF International Financial Statistics

Three month LIBOR: Offer London
Industrial Inflation
Export Unit Values: All Developing Countries, Non-Oil Developing Countries.

World Debt Tables/Global Development Finance Reports 1984-99

Interest, Principal, and Total Debt Due data came from the following series:
Contractual Obligations on Outstanding long-term debt:
- Principal and Interest to: a) Bilateral Creditors

²³ Data from principal sources was supplemented with additional information from the World Bank LDB, Unified Survey and from EIU reports.

- b) Multilateral Creditors
- c) Commercial Banks
- d) Other Private Creditors

Prior to 1991 contractual obligations were broken down only into Official and Private Creditors.

Finance Credit Risk (FINCR) Internal Records

IBRD History of Nonaccrual.

Global Development Finance 1999: Analysis and Summary Tables

Paris Club and Commercial Bank Rescheduling Agreements from Tables A3.2 and A2.3 respectively.

This source was supplemented by information from *The Institute of International Finance Surveys of Debt Restructuring by Commercial Banks/Official Creditors* and the IMF reports on *Official Financing for Developing Countries* and *Private Market Financing for developing countries*.

PRS International Country Risk Guide (ICRG) – 1984-99

The stated aim of the PRS political risk rating is to provide a means of assessing the political stability of the countries covered by ICRG on a comparable basis. This is done by assigning risk points to a pre-set group of political risk components. Points are assigned by the ICRG editors on the basis of a series of pre-set questions for each component, to ensure consistency between countries and over time. The minimum number of points that can be assigned to each component is zero, while the maximum number of points depends on the fixed weight that component is given in the overall political risk assessment. In every case the lower the risk point total, the higher the risk, and the higher the risk point total the lower the risk. We use the total political risk index, representing the sum of all components, together with the individual components themselves. Data are reported on a monthly basis, and hence we use the monthly average over the year for a given series.

The components and weights are as follows:

<u>Component</u>	<u>Weight</u>
A Government Stability	12
B Socioeconomic Conditions	12
C Investment Profile	12
D Internal Conflict	12
E External Conflict	12
F Corruption	6
G Military in Politics	6
H Religion in Politics	6
I Law and Order	6
J Ethnic Tensions	6
K Democratic Accountability	6
L Bureaucracy Quality	4

A brief description of each component is provided below:²⁴

Government stability - This is a measure both of the government's ability to carry out its declared program(s), and its ability to stay in office.

Socioeconomic conditions - This is an attempt to measure general public satisfaction, or dissatisfaction, with the government's economic policies. Socioeconomic conditions cover a broad spectrum of factors ranging from infant mortality and medical provision to housing and interest rates. PRS attempts to identify those factors that are important for the society in question, i.e. those with the greatest political impact, and assess the country on that basis.

²⁴ Descriptions are taken from those given by PRS in their June 1999 ICRG.

Investment profile - This is a measure of the government's attitude to inward investment as determined by our assessment of four sub-components: the risk to operations, taxation, repatriation and labor costs.

Internal conflict - This is an assessment of political violence in the country and its actual or potential impact on governance. The highest rating is given to those countries where there is no armed opposition to the government and the government does not indulge in arbitrary violence, direct or indirect, against its own people. The lowest rating is given to a country embroiled in an on-going civil war.

External conflict - The external conflict measure is an assessment both of the risk to the incumbent government and to inward investment. It ranges from trade restrictions and embargoes, whether imposed by a single country, a group of countries, or the international community as a whole, through geopolitical disputes, armed threats, exchanges of fire on borders, border incursions, foreign-supported insurgency, and full-scale warfare.

Corruption - This covers financial corruption in the form of demands for special payments and bribes, but places more weight on actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between politics and business.

Military in politics - This measures the extent of the military's involvement in the politics of a country, including both the presence of a military regime, and the risk of a military-takeover.

Religious Tensions - This measures tensions stemming from the domination of society and/or governance by a single religious group that seeks to replace civil law by religious law and to exclude other religions from the political and/or social process; the desire of a single religious group to dominate governance; the suppression of religious freedom; and the desire of a religious group to express its own identity, separate from the country as a whole. These tensions lead to the risk of inappropriate policies, civil dissent, and possible civil war.

Law and order - This is an assessment of the strength and impartiality of the legal system together with an assessment of the degree of popular observance of the law.

Ethnic tensions - This component measures the degree of tension within a country attributable to racial, nationality, or language divisions.

Democratic accountability - This is a measure of how responsive government is to its people, on the basis that the less responsive it is, the more likely it is that the government will fall, peacefully in a democratic society, but possibly violently in a non-democratic one.

Bureaucracy quality - The institutional strength and quality of the bureaucracy is another shock absorber that tends to minimize revisions of policy when governments change. Therefore, high points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government.

Note that prior to August 1997, 13 components instead of 12 were reported, with the Internal Conflict component being subdivided into separate components measuring Political Violence and the threat of Civil War. We opted to use the current categorization, adjusting the historical series accordingly, as our focus is on a working model for current and future use, for which only the 12 categories are available.

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